

CBE 30355 Transport Phenomena I

AI Problem 1

Due Tuesday 9/9/25

In this problem use AI to produce a LaTeX report on the design parameters of a variant on a Galileo thermometer. A block of paraffin is attached to a flexible steel chain whose other end is attached to the wall of a vessel containing water. The chain is in the shape of a U, part supported by the wall, and part by the (submerged) block of paraffin. As the temperature changes the coefficient of thermal expansion of the various materials causes the block to rise or fall, and thus the motion of the block can be used to read off the temperature. Because paraffin is very light, it is useful to attach a small weight (lead) to the bottom of the block to make it closer to neutrally buoyant.

If the chain we have available weighs 0.083g/cm and the paraffin block is 3cm thick what should be the design parameters of the thermometer if we want to have a vertical motion of 3mm/degree C ? Clearly describe the way in which the thermometer operates (e.g., which way does it go?).

Have your report provide the background of Galileo thermometers, and produce a diagram (TikZ) of the proposed system. Provide (verified!) references as well!

Append the prompt used to generate the report to the document. Comment on any corrections you had to make to the diagram, design, or repair of references (check them!).